US-PAT-NO: 6131368
DOCUMENT-IDENTIFIER: US 6131368 A

TITLE: Method for packaging adsorbents

DATE-ISSUED: October 17, 2000

US-CL-CURRENT: 53/400; 53/432 ; 53/434 ; 53/440

APPL-NO: 09/ 056305

DATE FILED: April 7, 1998

---------- KWIC ---------

Brief Summary Text - BSTX:

The present invention can also be used for packaging adsorbents that have been previously formed into **monoliths** such as blocks, cylinders, plates, and other similar shaped articles having fixed volumes. When used in this manner, all the benefits of the present invention are obtainable, except that packing density or attrition will not be substantially improved.

Brief Summary Text - BSTX:

In an other preferred embodiment, the adsorbent is powdered, granular, spherical, or pelletized activated carbon, zeolite, molecular sieves, polymeric adsorbents, or silica gel or mixtures thereof that have been previously formed into a **monolith** such as a block, a cylinder, a plate, or other similar shaped article having appreciable volume. The package is preferably a laminated bag made from polyethylene-aluminum foil. The maximum recommended temperature to which the bag can withstand is about 90.degree. C.

Therefore, the adsorbent is heated to a temperature between about 40.degree. and 90.degree. C. either inside the bag or prior to placement in the bag. The bag is hermetically sealed and cooled to about ambient temperature.

Brief Summary Text - BSTX:

The following examples illustrate preferred embodiments of the present invention but are not intended to limit the scope of the present invention. Example 1 illustrates that the present invention may be practiced with any adsorbent to achieve improvement in packing densities. Example 1 also demonstrates that the method of the present invention can be used with a package having **flexible walls**. Example 2 demonstrates that the advantages of present invention can be achieved using a rigid wall package. Example 3 illustrates a semirigid wall package and Example 4 demonstrates that the present invention provides reduced attrition losses when the container is subject to mechanical abrasion such as those in transportation. Example 5 illustrates that failure of the hermetic seal is readily observed.

US-PAT-NO: 6143853
DOCUMENT-IDENTIFIER: US 6143853 A

TITLE: Method for separation and synthetic polymers that can be used as
separation media in the method

DATE-ISSUED: November 7, 2000

US-CL-CURRENT: 526/332; **210/638** ; 502/401 ; 524/543

APPL-NO: 09/ 047469

DATE FILED: March 25, 1998

PARENT-CASE:

This application is a divisional of application Ser. No. 08/648,108, filed
Jul. 8, 1996, now U.S. Pat. No. 5,759,404, which is a continuation of PCT
International Application No. PCT/SE94/01090, filed on Nov. 17, 1994, under 35
U.S.C. .sctn. 371. The entire contents of each of the above identified
applications are hereby incorporated by reference.

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
SE	9303790	November 17, 1993

---------- KWIC ---------

Brief Summary Text - BSTX:

Typically, insoluble separation media are based on hydrophilic porous matrixes
built up of a synthetic polymer or a biopolymer, for instance poly(hydroxyalkyl
methacrylate), dextran or agarose. The matrixes have been in form of beads,
particles or **monoliths** (continuous forms). Often the

surface of the matrix has
been modified with a specific functionality in order to
provide the actual
interaction between solute molecules and ligands
immobilised on the matrix.

Brief Summary Text - BSTX:

Today, ion exchange is the most frequently used
chromatographic technique for
the separation of biomolecules. Other important techniques
are gel filtration,
hydrophobic interaction, reversed phase, metal chelate
chromatography, covalent
chromatography, and affinity **chromatography**. For a review
se J-C. Janson et
al.sup.1). The adsorption principles of these techniques
have also been
applied to other separation methodologies, for instance
batch procedures,
electrophoresis, centrifugation, etc.

Brief Summary Text - BSTX:

Vinyl ethers have been suggested as monomers in radical
polymerizations in
order to synthesize **chromatographic** support
particles.sup.16,17). However,
vinyl ethers are not susceptible to radical polymerization,
which indicates
that poly (vinyl ethers) are not enabled from this type of
publications.

Brief Summary Text - BSTX:

The organic residue R" may be selected from: groups
comprising affinity
ligands; groups enabling reversible disulfide binding of
thiol compounds to the
poly(vinyl ether) (e.g. covalent **chromatography**);
pronounced hydrophilic
groups; and groups rendering the poly(vinyl ether)
insoluble in aqueous liquids
(e.g. water).

Brief Summary Text - BSTX:

Water-insoluble matrix carriers may be of different physical forms such as beads, **monoliths,** balls, particles, tube walls, membranes etc. The matrix carriers may by organic or inorganic. They may be porous or non-porous. The material of the matrix carriers may be hydrophilic and based on insoluble polysaccharides like agarose or crosslinked dextran. The matrix carrier may also be hydrophobic, e.g. by being made from polystyrene.

Brief Summary Text - BSTX:

The general method comprises different **chromatographic** procedures, batch procedures, electrophoresis in gels and other suitable matrixes, adsorptions performed in immunoassays, centrifugations utilizing partition into polymers, membrane filtrations, separation methods based on complexation, precipitation and sedimentation by the aid of a polymer.

Brief Summary Text - BSTX:

For illustrative purposes separation by **chromatography** will be discussed in detail.

Brief Summary Text - BSTX:

Separation by **chromatography** depends on the differential partition of biomolecules between a stationary phase (the **chromatographic** media) and a mobile phase (the buffer solution, aqueous liquid phase). Normally the stationary phase is packed into a vertical **column of plastic,** glass or stainless steel, whereas the buffer is passed through this column.

Brief Summary Text - BSTX:

Since the development of the first cellulose ion exchangers by Peterson and
Sober.sup.12) and of the first practical gel filtration media by Porath and
Flodin.sup.13,14) a variety of adsorbents has been introduced which exploit
various properties of proteins. Important properties and corresponding
chromatographic methods are:

Brief Summary Text - BSTX:

The evaluation of the new polymers described in this work has so far been
performed by Gel Filtration and Ion Exchange **Chromatography**.

Brief Summary Text - BSTX:

2.5.1 Gel filtration **chromatography**

Brief Summary Text - BSTX:

In gel filtration, molecules in solution are separated according to differences
in their sizes as they pass through a column packed with a gel **chromatographic**
media. Suitable media have a carefully controlled pore range size and are
often formed by crosslinking a suitable hydrophilic polymer to a
three-dimensional net-work.

Brief Summary Text - BSTX:

2.5.2 Adsorption **chromatography**

Brief Summary Text - BSTX:

Adsorption **chromatography** depends upon interactions of different types between solute molecules and ligands immobilized on a **chromatographic** matrix. Affinity **chromatography,** ion exchange **chromatography,** covalent **chromatography,** metal chelate **chromatography** and hydrophobic interaction **chromatography** are illustrative examples of adsorption **chromatography**.

Brief Summary Text - BSTX:

The best experimental results so far has been accomplished with the **chromatographic** supports presented in the experimental part. However the inventors believe that better results will be obtained with poly(vinyl ethers) produced by the so called "living" or "controlled" cationic polymerization.

Brief Summary Text - BSTX:

The synthesized monomers and polymers were characterized by FTIR using a Perkin Elmer 16PC FTIR and by .sup.1 H and .sup.13 C NMR using a JEOL EX270. The elemental analysis was conducted by Mikro-Kemi AB in Uppsala, Sweden. The MWD of the polymers were determined by gel permeation **chromatography** (GPC) in THF on a Waters GPC-system equipped with two polystyrene gel columns (Ultrastyragel.RTM. 10.sup.4 .ANG. and Ultrastyragel.RTM. 10.sup.3 .ANG.; 7.8.times.300 mm each (U.S.A.)). The number-average molecular weight (M.sub.n) and the polydispersity ratio (M.sub.w /M.sub.n) were calculated from GPC curves on the basis of a polystyrene calibration. Ultrafiltration was carried out on a Filtron Ultrapump II equipped with Ultrasette filters 8 K and 30 K respectively. The gel filtration was carried out on a Liquid **Chromatography**

system. The glass column had an inner diameter of 10 mm and the bead height
was 30 cm. The eluent flow was 0.5 cm/min. The buffer solution was 50 mM
sodium phosphate+100 mM sodium chloride which gives a pH=7.4. The detector was
a single path monitor UV 1.RTM. at 280 nm (Pharmacia AB, Sweden).

Brief Summary Paragraph Table - BSTL:

						a. Size and shape
Gel Filtration	b.					
Net charge	Ion Exchange	**Chromatography**	c.	Isoelectric	point	Chromatofocusing
d. Hydrophobicity	Hydrophic	Interaction	**Chromatography**			
Reversed Phase						
Chromatography	e.	Metal	binding	Metal	Ion	Affinity
Chromatography	f.	Content				
of exposed	Covalent	**Chromatography**	thiol	groups	g.	
Biospecific	affinities					
Affinity **Chromatography**	for	ligands,	inhibitors,			
receptors,	antibodies	etc.				

Detailed Description Text - DETX:

4.7. **Chromatographic** evaluation

Detailed Description Text - DETX:

4.7.2. Anion Exchange **Chromatography**

Detailed Description Text - DETX:

The product from example 16, i.e. anion exchange polymer of example 11
covalently attached to a Sepharose.RTM. HP matrix, was compared with Q
Sepharose.RTM. HP in a representative protein separation. Proteins
(transferrin, ovalbumin and .beta.-lactoglobulin) were dissolved in a buffer
solution and applied to columns packed with the matrixes.

The two
chromatograms showed closely related elution profiles for the mixture of
proteins.

Detailed Description Text - DETX:

14) J-C. Janson, **Chromatographia,** 23, 361 (1987).

Current US Cross Reference Classification - CCXR:

210/638

US-PAT-NO: 5759404
DOCUMENT-IDENTIFIER: US 5759404 A

TITLE: Method for separation and synthetic polymers that can be used as
separation media in the method

DATE-ISSUED: June 2, 1998

US-CL-CURRENT: 210/638; 210/502.1 ; 210/635 ; 210/666 ; 502/401 ; 568/687

APPL-NO: 08/ 648108

DATE FILED: July 8, 1996

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
SE	9303790	November 17, 1993

PCT-DATA:

APPL-NO:	PCT/SE94/01090
DATE-FILED:	November 17, 1994
PUB-NO:	WO95/13861
PUB-DATE:	May 26, 1995
371-DATE:	Jul 8, 1996
102(E)-DATE:	Jul 8, 1996

---------- KWIC ---------

Abstract Text - ABTX:

The present invention is directed towards a separation method comprising the
steps: (i) contacting an aqueous liquid that contains a dissolved substance
that is to be enriched with a polymer under conditions allowing selective
partition of said substance to said polymer, whereafter (ii) said polymer
containing said substance is removed from said aqueous liquid. The polymer
employed is a poly(vinyl ether) having different or

identical vinyl ether
subunits (1) where X et Y are selected among hydrogen and methyl; and R is
selected among organic groups. A plurality of R are equal to a hydrophilic
organic group. One or more R comprise a bioaffinity ligand; an ion exchange
group, etc. The method may be applied to bioseparations such as gel, affinity,
ion exchange and covalent **chromatography** and corresponding batch procedures.
Also disclosed are vinyl ether polymers that can be employed in the method.

Brief Summary Text - BSTX:

Typically, insoluble separation media are based on hydrophilic porous matrixes
built up of a synthetic polymer or a biopolymer, for instance poly(hydroxyalkyl
methacrylate), dextran or agarose. The matrixes have been in form of beads,
particles or **monoliths** (continuous forms). Often the surface of the matrix has
been modified with a specific functionality in order to provide the actual
interaction between solute molecules and ligands immobilised on the matrix.

Brief Summary Text - BSTX:

Today, ion exchange is the most frequently used **chromatographic** technique for
the separation of biomolecules. Other important techniques are gel filtration,
hydrophobic interaction, reversed phase, metal chelate **chromatography**, covalent
chromatography, and affinity **chromatography**. For a review se J-C. Janson et al
(J-C. Janson et al., in "Protein Purification" VCH Publishers, Inc., 1989).
The adsorption principles of these techniques have also been applied to other
separation methodologies, for instance batch procedures, electrophoresis,
centrifugation, etc.

Brief Summary Text - BSTX:

Vinyl ethers have been suggested as monomers in radical polymerizations in order to synthesize **chromatographic** support particles (Hitatchi Chemical KK, Derwent Abstract 92-111582/14 (1992); Hitatchi Chemical KK, e.g. derwent Abstract 92-111583/14 (1992)). However, vinyl ethers are not susceptible to radical polymerization, which indicates that poly (vinyl ethers) are not enabled from this type of publications.

Brief Summary Text - BSTX:

The organic residue R" may be selected from: groups comprising affinity ligands; groups enabling reversible disulfide binding of thiol compounds to the poly(vinyl ether) (e.g. covalent **chromatography**); pronounced hydrophilic groups; and groups rendering the poly(vinyl ether) insoluble in aqueous liquids (e.g. water).

Brief Summary Text - BSTX:

Water-insoluble matrix carriers may be of different physical forms such as beads, **monoliths,** balls, particles, tube walls, membranes etc. The matrix carriers may by organic or inorganic. They may be porous or non-porous. The material of the matrix carriers may be hydrophilic and based on insoluble polysaccharides like agarose or crosslinked dextran. The matrix carrier may also be hydrophobic, e.g. by being made from polystyren.

Brief Summary Text - BSTX:

The general method comprises different **chromatographic**

procedures, batch
procedures, electrophoresis in gels and other suitable matrixes, adsorptions
performed in immunoassays, centrifugations utilizing partition into polymers,
membrane filtrations, separation methods based on complexation, precipitation
and sedimentation by the aid of a polymer.

Brief Summary Text - BSTX:

For illustrative purposes separation by **chromatography** will be discussed in
detail.

Brief Summary Text - BSTX:

Separation by **chromatography** depends on the differential partition of
biomolecules between a stationary phase (the **chromatographic** media) and a
mobile phase (the buffer solution, aqueous liquid phase). Normally the
stationary phase is packed into a vertical **column of plastic,** glass or
stainless steel, whereas the buffer is passed through this column.

Brief Summary Text - BSTX:

Since the development of the first cellulose ion exchangers by Peterson and
Sober (E. A. Peterson et al. J. Am. Chem. Soc., 78, 751 (1956)) and of the
first practical gel filtration media by Porath and Flodin (J. Porath et al.,
Nature, 183, 1657 (1959); J-C Janson, **Chromatographia,** 23, 361 (1987)) a
variety of adsorbents has been introduced which exploit various properties of
proteins. Important properties and corresponding **chromatographic** methods are:

Brief Summary Text - BSTX:

b. Net charge--Ion Exchange **Chromatography**

Brief Summary Text - BSTX:

d. Hydrophobicity--Hydrophic Interaction **Chromatography**
Reversed Phase
Chromatography

Brief Summary Text - BSTX:

e. Metal binding--Metal Ion Affinity **Chromatography**

Brief Summary Text - BSTX:

f. Content of exposed thiol groups--Covalent **Chromatography**

Brief Summary Text - BSTX:

g. Biospecific affinities for ligands, inhibitors,
receptors, antibodies
etc.--Affinity **Chromatography**

Brief Summary Text - BSTX:

The evaluation of the new polymers described in this work
has so far been
performed by Gel Filtration and Ion Exchange
Chromatography.

Brief Summary Text - BSTX:

Gel Filtration **Chromatography**

Brief Summary Text - BSTX:

In gel filtration, molecules in solution are separated
according to differences
in their sizes as they pass through a column packed with a
gel **chromatographic**

media. Suitable media have a carefully controlled pore range size and are
often formed by crosslinking a suitable hydrophilic polymer to a
three-dimensional net-work.

Brief Summary Text - BSTX:

Adsorption **Chromatography**

Brief Summary Text - BSTX:

Adsorption **chromatography** depends upon interactions of different types between
solute molecules and ligands immobilized on a
chromatographic matrix. Affinity
chromatography, ion exchange **chromatography,** covalent
chromatography, metal
chelate **chromatography** and hydrophobic interaction
chromatography are
illustrative examples of adsorption **chromatography**.

Brief Summary Text - BSTX:

The best experimental results so far has been accomplished with the
chromatographic supports presented in the experimental part. However the
inventors believe that better results will be obtained with poly(vinyl ethers)
produced by the so called "living" or "controlled" cationic polymerization.

Brief Summary Text - BSTX:

The synthesized monomers and polymers were characterized by FTIR using a Perkin
Elmer 16PC FTIR and by .sup.1 H and .sup.13 C NMR using a JEOL EX270. The
elemental analysis was conducted by Mikro-Kemi AB in Uppsala, Sweden. The MWD
of the polymers were determined by gel permeation
chromatography (GPC) in THF

on a Waters GPC-system equipped with two polystyrene gel columns
(Ultrastyragel.RTM. 10.sup.4 .ANG. and Ultrastyragel.RTM. 10.sup.3 .ANG.;
7.8.times.300 mm each (U.S.A.)). The number-average molecular weight (M.sub.n)
and the polydispersity ratio (M.sub.w /M.sub.n) were calculated from GPC curves
on the basis of a polystyrene calibration. Ultrafiltration was carried out on
a Filtron Ultrapump II equipped with Ultrasette filters 8K and 30K
respectively. The gel filtration was carried out on a Liquid **Chromatography**
system. The glass column had an inner diameter of 10 mm and the bead height
was 30 cm. The eluent flow was 0.5 cm/min. The buffer solution was 50 mM
sodium phosphate +100 mM sodium chloride which gives a pH=7.4. The detector
was a single path monitor UV 1.RTM. at 280 nm (Pharmacia AB, Sweden).

Detailed Description Text - DETX:

Chromatographic Evaluation

Detailed Description Text - DETX:

Anion Exchange **Chromatography**

Detailed Description Text - DETX:

The product from example 16, i.e. anion exchange polymer of example 11
covalently attached to a Sepharose.RTM. HP matrix, was compared with Q
Sepharose.RTM. HP in a representative protein separation. Proteins
(transferrin, ovalbumin and .beta.-lactoglobulin) were dissolved in a buffer
solution and applied to columns packed with the matrixes. The two
chromatograms showed closely related elution profiles for the mixture of

proteins.

Current US Original Classification - CCOR:

210/638

Current US Cross Reference Classification - CCXR:

210/502.1

Current US Cross Reference Classification - CCXR:

210/635

Current US Cross Reference Classification - CCXR:

210/666

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	3363	monolith	USPAT	2002/09/30 13:15
2	BRS	L2	73952	210/$.ccls.	USPAT	2002/09/30 13:16
3	BRS	L3	143	1 and 2	USPAT	2002/09/30 13:16
4	BRS	L4	5494	flexible adj wall	USPAT	2002/09/30 13:17
5	BRS	L5	0	3 and 4	USPAT	2002/09/30 13:17
6	BRS	L6	4	1 and 4	USPAT	2002/09/30 13:19
7	BRS	L7	185868	chromatogra$4	USPAT	2002/09/30 13:19
8	BRS	L8	52	3 and 7	USPAT	2002/09/30 13:25
9	BRS	L9	385646	plastic near 2 column	USPAT	2002/09/30 13:26
10	BRS	L10	1372	plastic near4 column	USPAT	2002/09/30 13:27
11	BRS	L11	2	8 and 10	USPAT	2002/09/30 13:33
12	IS&R	L12	1	("5334310").PN.	USPAT	2002/09/30 13:34
13	IS&R	L13	0	("continuous adj plug").PN.	USPAT	2002/09/30 13:35
14	BRS	L14	236	continuous adj plug	USPAT	2002/09/30 13:35
15	BRS	L15	16	2 and 14	USPAT	2002/09/30 13:36
16	BRS	L16	0	10 and 15	USPAT	2002/09/30 13:38
17	IS&R	L17	1	("5316680").PN.	USPAT	2002/09/30 13:39
18	IS&R	L18	1	("5453185").PN.	USPAT	2002/09/30 13:40
19	IS&R	L19	1	("5456185").PN.	USPAT	2002/09/30 13:41
20	IS&R	L20	1	("5207914").PN.	USPAT	2002/09/30 13:41

	Comments	Error Definition	Errors
1			0
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

	Type	L #	Hits	Search Text	DBs	Time Stamp
1	BRS	L1	3363	monolith	USPAT	2002/09/30 13:15
2	BRS	L2	73952	210/$.ccls.	USPAT	2002/09/30 13:16
3	BRS	L3	143	1 and 2	USPAT	2002/09/30 13:16
4	BRS	L4	5494	flexible adj wall	USPAT	2002/09/30 13:17
5	BRS	L5	0	3 and 4	USPAT	2002/09/30 13:17
6	BRS	L6	4	1 and 4	USPAT	2002/09/30 13:19
7	BRS	L7	185868	chromatogra$4	USPAT	2002/09/30 13:19
8	BRS	L8	52	3 and 7	USPAT	2002/09/30 13:25
9	BRS	L9	385646	plastic near 2 column	USPAT	2002/09/30 13:26
10	BRS	L10	1372	plastic near4 column	USPAT	2002/09/30 13:27
11	BRS	L11	2	8 and 10	USPAT	2002/09/30 13:33
12	IS&R	L12	1	("5334310").PN.	USPAT	2002/09/30 13:34
13	IS&R	L13	0	("continuous adj plug").PN.	USPAT	2002/09/30 13:35
14	BRS	L14	236	continuous adj plug	USPAT	2002/09/30 13:35
15	BRS	L15	16	2 and 14	USPAT	2002/09/30 13:36
16	BRS	L16	0	10 and 15	USPAT	2002/09/30 13:38
17	IS&R	L17	1	("5316680").PN.	USPAT	2002/09/30 13:39
18	IS&R	L18	1	("5453185").PN.	USPAT	2002/09/30 13:40
19	IS&R	L19	1	("5456185").PN.	USPAT	2002/09/30 13:41
20	IS&R	L20	1	("5207914").PN.	USPAT	2002/09/30 13:41

	Comments	Error Definition	Errors
1			0
2			0
3			0
4			0
5			0
6			0
7			0
8			0
9			0
10			0
11			0
12			0
13			0
14			0
15			0
16			0
17			0
18			0
19			0
20			0

L Number	Hits	Search Text	DB	Time stamp
1	3363	monolith	USPAT	2002/09/30 13:15
2	73952	210/$.ccls.	USPAT	2002/09/30 13:16
3	143	monolith and 210/$.ccls.	USPAT	2002/09/30 13:16
4	5494	flexible adj wall	USPAT	2002/09/30 13:17
5	0	(monolith and 210/$.ccls.) and (flexible adj wall)	USPAT	2002/09/30 13:17
6	4	monolith and (flexible adj wall)	USPAT	2002/09/30 13:19
7	185868	chromatogra$4	USPAT	2002/09/30 13:19
8	52	(monolith and 210/$.ccls.) and chromatogra$4	USPAT	2002/09/30 13:25
9	385646	plastic near 210/$.ccls. column	USPAT	2002/09/30 13:26
10	1372	plastic near4 column	USPAT	2002/09/30 13:27
11	2	((monolith and 210/$.ccls.) and chromatogra$4) and (plastic near4 column)	USPAT	2002/09/30 13:33
12	1	("5334310").PN.	USPAT	2002/09/30 13:34
13	0	("continuous adj plug").PN.	USPAT	2002/09/30 13:35
14	236	continuous adj plug	USPAT	2002/09/30 13:35
15	16	210/$.ccls. and (continuous adj plug)	USPAT	2002/09/30 13:36
16	0	(plastic near4 column) and (210/$.ccls. and (continuous adj plug))	USPAT	2002/09/30 13:38
17	1	("5316680").PN.	USPAT	2002/09/30 13:39
18	1	("5453185").PN.	USPAT	2002/09/30 13:40
19	1	("5456185").PN.	USPAT	2002/09/30 13:41
20	1	("5207914").PN.	USPAT	2002/09/30 13:41

L Number	Hits	Search Text	DB	Time stamp
1	3363	monolith	USPAT	2002/09/30 13:15
2	73952	210/$.ccls.	USPAT	2002/09/30 13:16
3	143	monolith and 210/$.ccls.	USPAT	2002/09/30 13:16
4	5494	flexible adj wall	USPAT	2002/09/30 13:17
5	0	(monolith and 210/$.ccls.) and (flexible adj wall)	USPAT	2002/09/30 13:17
6	4	monolith and (flexible adj wall)	USPAT	2002/09/30 13:19
7	185868	chromatogra$4	USPAT	2002/09/30 13:19
8	52	(monolith and 210/$.ccls.) and chromatogra$4	USPAT	2002/09/30 13:25
9	385646	plastic near 210/$.ccls. column	USPAT	2002/09/30 13:26
10	1372	plastic near4 column	USPAT	2002/09/30 13:27
11	2	((monolith and 210/$.ccls.) and chromatogra$4) and (plastic near4 column)	USPAT	2002/09/30 13:33
12	1	("5334310").PN.	USPAT	2002/09/30 13:34
13	0	("continuous adj plug").PN.	USPAT	2002/09/30 13:35
14	236	continuous adj plug	USPAT	2002/09/30 13:35
15	16	210/$.ccls. and (continuous adj plug)	USPAT	2002/09/30 13:36
16	0	(plastic near4 column) and (210/$.ccls. and (continuous adj plug))	USPAT	2002/09/30 13:38
17	1	("5316680").PN.	USPAT	2002/09/30 13:39
18	1	("5453185").PN.	USPAT	2002/09/30 13:40
19	1	("5456185").PN.	USPAT	2002/09/30 13:41
20	1	("5207914").PN.	USPAT	2002/09/30 13:41